CLAIMS

1. A method for controlling an optoelectronic component during a rise time period with control signals (1, 2),

- in which component there are at least two waveguides optically coupled to each other, the first waveguide (3) and the second waveguide (4), which form tracks to an optical signal,

- and in the beginning of which rise time period both control signals (1, 2) are on a common start level, namely on the first amplitude level (I), which is clearly higher than zero, so that the refractive indices of the waveguides (3, 4) are equal and the phase difference between them is zero,

- and at the end of which rise time period the first control signal (1) is on its target level, namely on the second amplitude level (II), which is clearly higher than the start level, and the second control signal (2) is correspondingly on its own target level, namely on the third amplitude level (III), which is clearly lower than the start level, so that the refractive indices of the waveguides (3, 4) are unequal and there is a predetermined phase difference between them,

- and the length of which rise time period is limited by the time required for generating and stabilising a phase difference change between the waveguides,

- and in which method the rise time period is shortened by adjusting the control signals between their start and target levels in an appropriate manner,

characterised in that for shortening the rise time period the second control signal (2) is first lowered to a fifth amplitude level (V), which is zero or substantially lower than the third amplitude level (III), and simultaneously the first control signal (1)

is set to a fourth amplitude level (IV), which is clearly higher than the second amplitude level (II), and finally both control signals are set to their target level, and during which rise time period the control signals are adjusted so that in the last part of the rise time period the phase difference between the waveguides is already substantially settled to its target value, while the refractive indices of the individual waveguides are still clearly changing towards their target values, i.e. settling.

2. Method according to claim 1, **characterised** in that for obtaining a more step-wise phase difference change, the first control signal (1) is set from the fourth amplitude level (IV) to a seventh amplitude level (VII), which is lower than the second amplitude level (II), before it is set to the second amplitude level (II).

3. Method according to claim 2, **characterised** in that the seventh amplitude level (VII) is chosen to be substantially equal with the fifth amplitude level (V).

4. Method according to any of claims 1 - 3, **characterised** in that for shortening the rise time period, the fourth amplitude level (IV) of the first control signal (1) is chosen so high that the phase difference clearly tends to rise above the predetermined target value of the phase difference, so that a so called overshoot of the refractive index is formed, and for compensating the overshoot the amplitude of the second control signal (2) is raised to a sixth amplitude level (VI), which is higher than the fifth amplitude level (V).

5. Method according to any of claims 1 - 4, **characterised** in that for shortening the rise time period, the target level of the second control signal (2), namely the third amplitude level (III), is chosen to be higher than zero.

6. A method for controlling an optoelectronic component during a fall time period with control signals (1, 2),

- in which component there are at least two waveguides optically coupled to each other, the first waveguide (3) and the second waveguide (4), which form tracks to an optical signal,

- and at the beginning of which fall time period the first control signal (1) is on its start level, namely on the second amplitude level (II), which is clearly higher than the target level, and the second control signal (2) is correspondingly on its own start level, namely on the third amplitude level (III), which is clearly lower than the target level, so that the refractive indices of the waveguides (3, 4) are unequal and there is a predetermined phase difference between them,

- and in the end of which fall time period both control signals (1, 2) are on a common target level, namely on the first amplitude level (I), which is substantially higher than zero, so that the refractive indices of the waveguides (3, 4) are equal and the phase difference between them is zero,

- and the length of which fall time period is limited by the time required for generating and stabilising a phase difference change between the waveguides,

- and in which method the fall time period is shortened by adjusting the control signals between their start and target levels in an appropriate manner,

characterised in that for shortening the fall time period the first control signal (1) is first lowered to an eighth amplitude level (VIII), which is zero or substantially lower than the first amplitude level (I), and simultaneously the second control signal (2) is set to a ninth amplitude level (IX), which

is substantially higher than the first amplitude level (I), and finally both control signals are set to the first amplitude level (I), and during which fall time period the control signals are adjusted so that in the beginning of the rise time period the refractive index difference between the waveguides decreases fast to zero and during the last part of the fall time period it substantially remains at zero, so that the phase difference between the waveguides is already substantially settled to zero, while the refractive indices of the individual waveguides are still clearly changing towards their common target value, i.e. settling.

7. Method according to claim 6, **characterised** in that for obtaining a more step-wise phase difference change, the second control signal (1) is set from the ninth amplitude level (IX) to the tenth amplitude level (X), which is lower than the first amplitude level (I), before it is set to the first amplitude level (I).

8. Method according to claim 7, **characterised** in that the tenth amplitude level (X) is chosen to be substantially equal with the eighth amplitude level (VIII).

9. Method according to any of claims 1 - 8, **characterised** in that at least one of the following is chosen to be zero: third amplitude level (III), fifth amplitude level (V), seventh amplitude level (VII), eighth amplitude level (VIII), tenth amplitude level (X).

10. Method according to any of claims 1 - 9, **characterised** in that the phase difference between the first and the second waveguide is modulated with two or several successive modulators (10, 11).

11. Method according to claim 10, **characterised** in that the modulators (10, 11) are controlled to operate in turn.

12. Method according to claim 11, **characterised** in that only some of the successively intended phase difference changes are implemented with control signals corresponding to one modulator (10) and other phase difference changes are implemented with the control signals of the following one or several modulators that are arranged successively with respect to the aforementioned modulator (11) so that the phase difference changes caused by them sum up, so that the next phase difference change can be implemented with the next modulator as soon as the previous phase difference change is implemented, although the refractive indices of the waveguides of the modulator that implemented it have not yet settled to their target levels.

13. Method according to any of claims 1 - 12, **characterised** in that at least two successive modulators (10, 11) are mutually different so that the first modulator (10) is significantly faster and consumes more power than the second modulator (11), so that the first modulator is used for implementing fast and/or successive phase difference changes and the second modulator is used for implementing slow and/or single phase difference changes and for implementing long static operating states, so that the average power consumption is significantly smaller than by using only the first modulator and the maximum modulation speed is significantly higher than by using only the second modulator.

14. Method according to any of claims 1 - 13, **characterised** in that during their rise and/or fall time periods the control signals are optimised so that they depend, not only on the start and target state of the phase difference, but also on at least one phase difference change that precedes the start state and/or succeeds the target state of the phase difference, so that the optimisation takes into account such potential settling time that immediately precedes and/or

succeeds the given phase difference change, and during which settling time the phase difference has already reached its target value, but the refractive indices of the waveguides have not yet settled.

15. Method according to any of claims 1 - 14, **characterised** in that the predetermined target value of the phase difference is set to be approx. 180°.

16. Method according to any of claims 1 - 15, **characterised** in that the waveguides (3, 4) are arranged as waveguides on planar substrates.

17. Method according to claim 16, **characterised** in that the waveguides (3, 4) are chosen among:

- SOI (silicon-on-insulator) waveguides,
- glass waveguides,
- polymer waveguides,
- compound semiconductor waveguides.

18. Method according to any of claims 1 - 17, **characterised** in that the optoelectronic component is chosen to be an optical switch, like an interferometric optical switch.

19. Method according to any of claims 1 - 18, **characterised** in that the optoelectronic component is chosen to be a component which includes one or several Mach-Zehnder interferometers, which forms an optical switch or a filter.

20. Method according to any of claims 1 - 19, **characterised** in that the optical switch is chosen to be a thermo-optic switch where the modulators (10, 11) are heating elements (5, 6; 7, 8) that heat the waveguides (3, 4) and electrical control signals (1, 2) consist of control voltage/current pulses directed to the heating elements, so that a control signal amplitude level corresponds to the heating power induced in the heating element by a control voltage/current pulse.